CHAPTER 2

Tissues

SYNOPSIS

- Group of cells having a common origin, similar on related structure which work together to perform a common function is called **tissue**.
- Study of tissues is called **Histology**.
- **Tissues** become organized to form **organs** and organs into **organ system**.
- The formation of tissues has brought about by the division of labour in multicellular organisms.

Plant Tissues

- Plant tissues are of two types: **Meristematic** and **Permanent**.
- Permanent tissues are of two types: **Simple** and **Complex**.
- Meristematic tissue comprises of a group of **thin walled**, **compactly arranged**, **immature cells** that have the **potential to divide** and form new cells.
- The regions where meristem is present can functions as growth region. These cells slowly grow, differentiate and mature into various components of permanent tissues.
- On the basis of position in the plant body, meristems are of three types: **apical** (growing tips of stems and roots), **intercalary** (intermediate position at the base of leaves, internodes) and **lateral** (lateral side on stem and root).
- **Permanent tissues** comprises of cells that have **lost the ability to divide** and have assumed a permanent shape, size and formation.
- These are derived from meritematic cells by differentiation.
- Simple permanent tissues are those in which the permanent cells are similar in structure, origin and function.
- Simple permanent tissues are of three types: **Parenchyma**, **Collenchyma** and **Sclerenchyma**.

Parenchyma

- **Parenchyma** is the **most abundant tissue of plants** which are thin walled, relatively unspecialized living cells loosely packed with large inter cellular spaces.
- Main functions includes support, gaseous exchange, transportation, protection and storage of food.
- Chlorophyll containing parenchyma performing photosynthesis is called **chlorenchyma** and air cavity possessing parenchyma in aquatic plants providing buoyancy as **aerenchyma**.

Collenchyma

- Collenchyma is a simple permanent living tissue which provides **flexibility** to soft aerial parts so that they can bend without breaking.

- These cells are **unevenly thickened at conners** and provides **mechanical support** to the plants.

Sclerenchyma

- Sclerenchyma is a simple permanent **dead tissue** with highly **thick walled cells** made **of lignin**.
- It provides **mechanical support** to the plants.
- Sclerenchyma are of two types: **Fibres** (spindle shaped) and **sclereids** (short) or **stone cells** or **grit cells**.

Complex Tissues

- Complex permanent tissue are **heterogenous** in nature, composed of both living and dead cells of varying shapes, sizes and functions.
- The complex permanent tissues are conducting tissues like **Xylem** and **Phloem**.

Xylem

- Xylem is a complex tissue which performs the function of **transport of water** and mineral or sap inside the plant and also provides **mechanical strength**.
- Xylem is also called **wood** and consists of four types of elements: **Tracheids Vessels**, **Fibres** and **Parenchyma**.
- **Tracheids** are long, tubular **dead cells** with **lignified walls**, **wide lumen** and **tapering ends**.
- Tracheids possess various types of thickenings for mechanical strength and are **seen in Gymnosperms**.
- **Vessels** are long cylindrical tube like **dead cells** with **lignified walls** and a large central cavity.
- **Vessels** are **seen in Angiosperms**.
- Vessels and trachids are conducting or **tracheary elements** of xylem.
- Xylem parenchyma consists of living cells which store food and other substances.
- Xylem fibres are sclerenchyma fibres which have thick walls, narrow lumen and tapering ends which provide **mechanical strength**.

Phloem

- Phloem is a complex permanent tissue which takes part in **conduction of** organic **food** inside the plant.
- Phloem is called **living conducting tissue** as it's transport channels are made of living cells.
- It is also called **bast tissue**.
- Phloem is made of four types of elements. **Sieve elements**, **companion cells**, **phloem parenchyma** and **phloem fibres**.
- Sieve elements are elongated tubular living conducting channels of phloem. These are arranged end to and in linear rows with septa called **sieve plates** containing **sieve pores**.
- **Companion cells** are specialised **parenchymatous cells**, which are found closely associated with sieve tube elements.
- Companion cell and associated sieve tube cell are sister cells as they develop from same mother cell.
- **Phloem parenchyma** are thin walled, living cells which functions in storage and show **lateral conduction of food**.
- Phloem fibres are the only non-living component of phloem made up of sclerenchymatous fibres which are spindle shaped and possess narrow lumen.
- They provide mechanical strength to the tissue.
- Mature **sieve tube** elements are **enucleated** at maturity.
- Phloem fibres are also known as **bast fibres** (**Jute**).

Tissue System in Plants

- Tissues are classified into three major categories: **epidermal tissue system**, **ground tissue** system and **vascular system**.

Epidermal Tissue System

- Epidermal tissue system forms the outer most covering of the whole plant body.
- Epidermis is usually single layered and made up of parenchymatous cells and is often covered with a **waxy** thick layer called **cuticle** which prevents the loss of water in young stem and leaves.
- In leaf epidermis, structures called **stomata** are present, which **regulate transpiration** and **gaseous exchange**.
- **Each stoma** is composed of two bean shaped cells known as **guard cells** and there enclose **stomatal pore**.
- In addition, the epidermis bears a number of **hairs on roots** which help in **water absorption** from the soil.
- The **epidermal hairs on the stem** are called **trichomes** which help in preventing water loss due to transpiration.

Ground Tissue System

- The internal regions **excluding the epidermis and vascular tissues** are known as **ground tissues**.
- **Ground tissue** system consists of simple tissues such as **parenchyma**, **collenchyma** and **sclerenchyma**.

- In leaves, the ground tissue consists of thin walled chloroplast containing cells called **mesophylls** which help in **photosynthesis**.

Vascular Tissue System

- Vascular tissue system comprises the complex tissues like **phloem** and **xylem**.
- The xylem and phloem together constitute **vascular bundles**.
- Vascular bundles may be **open** or **closed** types.
- In **dicot stem, cambium is present** between xylem and phloem and it helps in **secondary growth**.
- Vascular bundle **with cambium** is known as **open**.
- In **monocot** stem, **cambium is absent** and **no secondary growth** occurs, hence referred to as **closed type**.
- In **roots**, xylem and phloem in the vascular bundles are arranged in alternate pattern at different radii, the arrangement is called **radial**.
- In **stems** and **leaves**, xylem and phloem are arranged at same radius of vascular bundles and hence called **conjoint** and **collateral**.

Animals Tissues

- Animal tissues are group of cells specialized to perform special functions and organized to form organs which co-ordinate the animals body.
- Animal tissues can be broadly classified into four basic types on the basis of their structure and functions. These are: 1) **Epithelial tissue** 2) **Connective tissue** 3) **Muscular tissue** and 4) **Nervous tissue.**

Epithelial Tissue

- Epithelial tissue is a **fundamental animal tissue** which forms a continuous **sheet of closely packed cells** that covers all the external and internal surfaces of the animal body.
- It is the **simplest** animal tissue.
- The epithelial cells are compactly packed with little intercellular matrix.
- They generally **lack blood vessels** but have a good **power of repair** after injury.
- The **functions** of epithelial cells include **protection**, **absorption** and **secretion**.
- Epithelia are classified on the basis of arrangement of layers, cell shape and functions.
- On the basis of arrangement of layers, these are;
- **Simple epithelium:** The tissue is made of a **single layer** of cells
- **Stratified/compound epithelium**: The tissue consists of **more than one layer** of cells.
- On the basis of cell shapes, the epithelial tissues are of three types: **Squamous, cuboidal/cubical and columnar.**

Squamous epithelium

- Squamous epithelium is composed of a single layer of flat, tile, like polygonal cells. It is also called **pavement epithelium**.
- Squmous epithelium may be **simple** (single layered) or **stratified** (compound or multilayered).
- Simple squamous epithelium occurs in lung alveoli, Bowman's capsule, blood capillaries etc.
- Stratified squamous epithelium occurs in areas where there is **regular wear and tear** occurseg: buccal cavity, pharynx, skin etc.

Cuboidal epithelium

- Cuboidal epithelium consists of short, cube shaped cells with round centrally placed nucleus.
- Micro villi seen on the free surface of this tissue add an increasing absorptive area.
- Cuboidal epithelium is of two types: **simple** and **stratified**.
- Simple cuboidal epithelium occurs in the lining of kidney tubules, ducts of salivary and thyroid gland, germinal epithelium of sex organs etc.
- Cuboidal epithelium takes part in secretion, excretion and absorption.

Columnar epithelium

- Columnar epithelium consists of tall pillar like compactly arranged cells.
- Nucleus is oval and lies near the base of the columnar epithelial cell.
- Free surface may bear a number of tiny finger like projections called **micro villi** which increase the absorptive area.
- Like other epithelia, columnar epithelium may be **simple** and **stratified**.
- These occurs in the lining layer of stomach, intestine and their glands.

- On the basis of specific functions, the epithelial tissues are of two types: **Ciliated** and **Glandular**.
- Ciliated epithelium is columnar or cuboidal where the cells **bear cilia on their free surface**.
- Ciliated epithelium occurs in sperm ducts, uriniferous tubules, lining of respiratory tract and oviducts.
- Glandular epithelium is either columnar or cuboidal which is often infolded to form multicellular glands which secrete chemical substances. E.g., sweat glands, oil glands, digestive glands and endocrine glands.

Connective Tissue

- Connective tissue is the **most abundant tissue** seen in the animal body.
- These have scattered living cells embedded in an abundant matrix that helps in connecting, binding, packing and supporting different structure of the animal body.
- In all connective tissues except blood, the **cells secrete fibres** of structural proteins called **elastin** and **collagen**.
- The fibres provide strength, elasticity and flexibility to the tissues.
- Cells also secrete modified polysaccharides which accumulate between cells and fibres and act as **ground substance** or matrix.
- Connective tissue are classified into three types as
  1) **Loose connective tissue**
  2) **Dense connective tissue**
  3) **Specialized connective tissue**
- **Loose** connective tissue has cells loosely arranged in the matrix eg: **Areolar** tissue (found beneath the skin) and **adipose** tissue (storage of fats).
- **Dense** connective tissue has abundant fibres and smaller amount of matrix eg: **Ligaments** (connecting bone to bone) and **tendons** (connecting bone to muscle).
- **Specialized connective tissue** includes **cartilage**, **bone** and **blood**.
- **Cartilage** is firm but flexible **supportive** connective tissue in which the solid matrix contains living cells called **chondrocytes**.
- **Cartilage** is present in the tip of nose, outer ear joints, epiglottis, larynx, trachea and inter-vertebral discs.
- **Bone** is a solid, rigid, non-flexible tissue **rich in calcium salts** and **collagen fibres** which give them its strength.
- Bone is the main tissue which forms the structural framework of the body and protects the soft organs.
- The **bone cells** or **osteocytes** are present in spaces called **lacunae** around nutrients filled **Haversian canals**.
- The bone cavities contain an internal soft special connective tissue called **bone marrow** which are the **sites of blood cell formation**.
- **Blood** is the vascular connective tissue containing **plasma**, **red blood cells** (**RBC**), **white blood cells** (**WBC**) and **platelets**.
- Plasma constitutes 55% of the blood and contains **plasma proteins**.
- Plasma proteins are **albumin globulin** and **fibrinogen**.
- Blood is the main **circulating fluid** that helps in transport of various substances.
- **RBC** contains the reddish pigment called **haemoglobin** for **transport of oxygen** and **CO_2**.
- WBC are colourless nucleated cells mainly providing immunity.
- Platelets are non-nucleated colourless cells helping in blood coagulation or clotting.
- **RBCs are enucleated** and devoid of **other cell organelles**.
- WBCs are also known by **leucocytes**.
- **Neutrophils**, **eosinophils** and **basophils** are **granulocytes** of WBCs.
- **Lymphocytes** and **monocytes** are the **agranulocytes** of WBCs.

Muscular Tissue

- Muscular tissue is a **contractile tissue** which is responsible for **movements** and **locomotion**.
- Cells of the muscular tissue are elongated and are called **muscle fibres**.
- The contractile elements of muscle fibres are called **myofibrils** with two types of protein filaments as **actin** and **myosin**.
- These actins and myosins overlap in parallel fashion and produce striations in muscle cells.
- **Muscular tissue** occupies **nearly 40% of total weight** of the body.
- Muscles are classified on the basis of their location, appearance and nature of regulation of their activities as
  1) **Striated muscles**
  2) **Smooth muscles**
  3) **Cardiac muscles**

Skeletal/Striated Muscles

- Skeletal/striated muscles are closely associated with the skeletal components of the body.
- These have a **striped appearance** and hence are called **striated muscles**.
- These are long, cylindrical cells and are **multinucleate** (**syncytium**).
- Striated muscles are **voluntary in their action** and are primarily involved in **locomotory actions** and **changes of body postures**.

Smooth Muscles

- **Smooth muscles** are non-striated and are located in the inner walls of hollow visceral organs of the body like alimentary canal, reproductive tract etc.
- These are spindle shaped, unbranched and uninucleate.
- Smooth muscles are **not** under the **voluntary** control of the nervous system and are **involuntary**.
- These assist in the **transportation of food** through the digestive track and **gametes** through the genital tract.

Cardiac Muscles

- **Cardiac muscles** are involuntary, striated and non-fatigued muscles fibres which are the **muscles of heart**.
- The fibres are short, cylindrical and branched.
- In the area of union between two adjacent cells, zig-zag junctions are present and are called **intercalated discs** which allows them to contract as a unit.

Nervous Tissue

- **Nervous (neural) tissue** is a tissue specialised in **reception**, **integration** and **transmission of stimuli** or **impulses** to various parts o the body.
- The brain, spinal cord and nerves are all composed of the nervous tissue.
- The cells of nervous tissue are called **nerve cells** or **neurons**.
- A neuron consists of a **cell body** with a nucleus and cytoplasm, from which long thin hair like parts arise.
- Usually each neuron has a single long part called the **axon** and many short, branched parts called **dendrites**.
- **Dendrites pick up impulses** and transmit towards the **cell body** where **axon** carries impulses away from the cell body.
- Axon is surrounded by a sheath of special connective tissue cells called **Schwann cells**.
- Nerve fibres are of two types like **Myelinated** (which possess **myelin sheath**) and **non-myelinated** (**without myelin**).
- In myelinated nerve fibres, at places **myelin is absent** is called **Nodes of Ranvier**.
- Junctions of nerve endings with adjacent neurons are called **synapses** and are **mean for transmission of impulses** from one neuron to the next.
- Transmission of impulse is generally carried out with the help of chemical **neuron transmitter** called **acetylcholine**.

PRACTICE EXERCISE 2 (A)

Directions for questions 1 to 40: Select the correct alternative from the given choices.

1. Consider the following features of tissues.

A. They are similar or dissimilar cells
B. They are performing a common function.
C. They have common origin.
D. They are characterised by distinct cell wall.

The **correct** ones are grouped in

(1) A, B and D (2) B, C and D
(3) A, B and C (4) A, C and D

2. Which of the following helps in increasing the height of plant?

(1) Apical meristem
(2) Cambium
(3) Intercalary meristem
(4) Vascular bundle

3. Permanent tissues differ from meristematic tissue in

A. Inability to divide
B. Attainment of definite size and shape.
C. Perfomming a distinct function
D. Ability to divide

(1) A, B and C (2) A, C and D
(3) B, C and D (4) A, B and C

4. Parenchyma cells involved in photosynthesis are

(1) Aerenchyma
(2) Chlorenchyma
(3) Sclerenchyma
(4) Collenchyma

5. Grittiness of fruit wall is due to the presence of

(1) Sclerids (2) Sclerenchyma fibres
(3) Tracheids (4) Collenchyma

6. Which of the following elements of xylem helps in lateral conduction of water?

(1) Xylem tracheids
(2) Xylem parenchyma
(3) Xylem vessels
(4) Xylem fibres.

7. Plant tissue responsible for stiffness in husk of coconut is

(1) Sclerids (2) Phloem cells
(3) Xylem fibres (4) Sclerenchyma fibres

8. The most abundant tissue seen in *Hydrilla* and *Eichhormia* plants is

(1) Aerenchyma (2) Collenchyma
(3) Sclerenchyma (4) Phloem

9. Xylem vessels are absent in

(1) Dicotyledons (2) Monocotyledons
(3) Gymnosperms (4) Angiosperms

10. Cork cells are generally impervious to water and gases because of the presence of:

(1) Cellulose (2) Suberin
(3) Pectin (4) Lignin

11. Which of the following tissues have cells with large central vacuoles and irregular thickening at the corner?

(1) Parenchymatous tissue
(2) Collenchymatous tissue
(3) Sclerenchymatous tissue
(4) Meristematic tissue

12. The dead cell component present in phloem is:

(1) Phloem fibres
(2) Companion cells
(3) Phloem parenchyma
(4) Sieve tube

13. The chemical substance present in the thickening wall of collenchyma is

(1) Lignin (2) Cellulose
(3) Pectin (4) Both (2) and (3)

14. Select the **incorrect** pair from the following.

A. Parenchymatous tissues have intercellular spaces.
B. Apical and intercalary meristems are permanent tissues.
C. Aerenchyma is specialized for photosynthesis.
D. Collenchymatous tissues are irregularly thickenedat the corners.

(1) A and C (2) A and D
(3) B and C (4) B and D

15. Morphology of economically using jute, flax and hemp is

(1) Phloem fibres (2) Xylem fibres
(3) Fibres and sclereids (4) Bark layer

16. Most abundant tissue seen in animal body is:
(1) Epithelial tissue (2) Connective tissue
(3) Muscular tissue (4) Nervous tissue

17. Which part of the bone is specialized to form the cells?
(1) Harvesian canal (2) Osteoblasts
(3) Osteocytes (4) Red bone marrow

18. Tissue formed in area of regular wear and tear is:
(1) Simple cuboidal
(2) Simple squamous
(3) Stratified squamous
(4) Stratified cuboidal

19. The epithelium which forms the inner wall of blood vessels is
(1) Cuboidal epithelium
(2) Ciliated epithelium
(3) Squamous epithelium
(4) Compound epithelium

20. The dense strong tissue with parallel bundles of collagen fibres which joints a skeletal muscle with a bone is called:
(1) Tendon (2) Ligament
(3) Fibroblast (4) Elastin

21. Plasma content of connective tissue blood is
(1) 80% (2) 55%
(3) 65% (4) 95%

22. Cells of cartilaginous tissue are called
(1) Osteocytes (2) Choanocytes
(3) Melanocytes (4) Chondrocytes

23. Fibroblasts, macrophages and mast cells are present in
(1) Adipose tissue
(2) Areolar tissue
(3) Cartilaginous tissue
(4) Compound epithelium

24. Matrix of bone consists of:
(1) Ossein
(2) Phosphate
(3) Carbonates of calcium and magnesium
(4) All (1), (2) and (3)

25. The connective tissue known as 'middleman' is
(1) Lymph (2) Blood
(3) Serum (4) Bone

26. Which of the following is non-vascular?
(1) Nervous tissue (2) Connective tissue
(3) Epithelial tissue (4) Muscular tissue

27. Fats are stored in human body as:
(1) Areolar tissue (2) Adipose tissue
(3) Cartilage (4) Bone marrow

28. Striated muscles which are voluntary in nature
(1) Skeletal muscles (2) Cardiac muscles
(3) Smooth muscles (4) Visceral muscles

29. Most abundant blood cells among the WBCs are:
(1) Erythrocytes (2) Monocytes
(3) Neutrophils (4) Lymphocytes

30. Maximum intercellular substance is found in
(1) Connective tissue (2) Nervous tissue
(3) Muscular tissue (4) Epithelial tissue

31. In cardiac muscles, certain communication junctions to the fusion points allow the cells to contract as a unit and is known as
(1) Interstitial disc (2) Interdigitated disc
(3) Cell junctions (4) Intercalated disc

32. Pick out the wrong statement regarding muscular tissue:
(1) Muscular tissue comprises 40 to 50% of body weight.
(2) It is the abundant tissue in animals body.
(3) It is mesodermal in origin
(4) The main function includes movements and locomotion.

33. Nodes of Ranvier are areas where:
(1) Joints occur between adjacent axons
(2) Axon terminal forms synapse with dendrites.
(3) Dendrites of one nerve cells to adjacent nerve cells
(4) Non-myelinated areas of myelenated nerve fibre

34. A nerve cell transmits it's impulse to another through its:
(1) Dendrite (2) Cyton
(3) Axons (4) Synaptic knob

35. Area of coming together of two neuron ends in between a dendrite and axon end is known as
(1) Synapse (2) Synapsis
(3) Cell junction (4) Synapticula

36. Voluntary muscles are found in

(1) Alimentary canal (2) Limbs
(3) Iris of eye (4) Bronchi

37. Muscular tissues which function throughout the life continuously without fatigue is

(1) Skeletal muscle
(2) Smooth muscle
(3) Cardiac muscle
(4) Voluntary muscle

38. Intestine absorbs the digested food material. What type of epithelial cells are responsible for this absorption?

(1) Stratified epithelium
(2) Columnar epithelium
(3) Cuboidal epithelium
(4) Squamous epithelium

39. Cells which are long, cylindrical, unbranched and multinucleate are:

(1) Striated muscles (2) Smooth muscles
(3) Areolar tissue (4) Cardiac muscles

40. The connective tissue found at the tip of nose, outer ear joints, larynx and trachea are

(1) Bone (2) Tendon
(3) Ligament (4) Cartilage

PRACTICE EXERCISE 2 (B)

Directions for questions 1 to 40: Select the correct alternative from the given choices.

1. Which one of the tissue forms the major part within the organs of plants?

(1) Prenchyma (2) Fibres
(3) Collenchyma (4) Sclereids

2. Which one of the following characteristic feature is not applicable to parenchyma?

(1) It forms the major tissue within organs.
(2) Cells are generally brick shaped closely packed with intercellular spaces.
(3) Their walls are thin and made up of cellulose.
(4) Parenchyma perform the functions like photosynthesis, storage, secretion and mechanical support.

3. Choose the incorrect pair from the following:

(1) Guard cells – Seen around the stomatal pore
(2) Collenchyma – Living mechanical tissue
(3) Aerenchyma – Dead mechanical tissue
(4) Chlorenchyma – Seat of photosynthesis

4. The presence of vessels and companion cells are the characters of:

(1) Gymnosperms (2) Angiosperms
(3) Pteridophytes (4) Bryophytes

5. Find the incorrect statements from the following:

A. Root hairs are multicellular elongation of the epidermal cells.
B. Trichomes are unicellular epidermal hairs of the stem.
C. Guard cells are specialized cells regulating opening and closing of stomata.
D. Cuticle, collenchyma and stomata are absent in roots

(1) A, C and D are incorrect
(2) B, C and D are incorrect
(3) A and B are incorrect
(4) B and D are incorrect

6. Conjoint, closed type of vascular bundles are characteristic of:

(1) Monocot stem (2) Dicot stem
(3) Monocot root (4) Dicot root

7. The small aerating pores seen on cork layer of woody stem are

(1) Guard cells (2) Subsidiary cells
(3) Trichomes (4) Lenticels

8. Which of the following is/are composed of dead cells?

(1) Sclerenchyma (2) Tracheids
(3) Vessels (4) All (1), (2) and (3)

9. The length of stem increases due to

(1) Cambial activity (2) Apical meristem
(3) Lateral meristem (4) Cork cambium

10. Some parts of the plants are flexible due to the presence of:

(1) Parenchyma (2) Sclerenchyma
(3) Collenchyma (4) Meristem

11. Which of the following is not a feature or function of epidermis?

(1) Thick walled cells
(2) Protection from mechanical injury
(3) Gaseous exchange through stomatal pores
(4) Trichomes and glandular hairs.

12. Match the contents of column I with column II:

	Column I		**Column II**
A.	Xylem	(i)	Gaseous exchange
B.	Lenticels	(ii)	Translocation of food
C.	Guard cells	(iii)	Transport of sap
D.	Phloem	(iv)	Transpiration

(1) A - (i), B - (ii), C - (iii), D - (iv)
(2) A - (iii), B - (i), C - (iv), D - (ii)
(3) A - (ii), B - (i), C - (iv), D - (iii)
(4) A - (iii), B - (iv), C - (i), D - (ii)

13. The covering tissue of external and internal surfaces of animal body is

(1) Connective (2) Epithelial
(3) Muscular (4) Areolar

14. Trapped dust particles are cleaned from the respiratory tract by:

(1) Ciliated epithelium
(2) Stratified epithelium
(3) Glandular epithelium
(4) Sensory epithelium

15. Largest cells in human blood are:

(1) Erythrocytes (2) Neutrophils
(3) Monocytes (4) Basophils

16. The principal cation present in the blood plasma is

(1) K^+ (2) Mg^{2+}
(3) Ca^{2+} (4) Na^+

17. Choose the wrong pair regarding connective tissue:

(1) In most of the connective tissues, the cells secrete fibres made up of collagen and elastin.
(2) It is ectodermal in origin
(3) Ligaments connect the bone to muscles whereas tendron connects bone to bone.
(4) Connective tissue helps in connecting, binding, packing and supporting different structures of the animal body.

18. The striated muscles are

(1) Multinucleate (2) Uninucleate
(3) Binucleate (4) Anucleate

19. The epithelium of the alveoli of lung is

(1) Stratified epithelium
(2) Columnar epithelium
(3) Squamous epithelium
(4) Cuboidal epithelium

20. Hardest substance of the body is

(1) Bone (2) Enamel
(3) Cartilage (4) Tendron

21. Which of the following are involved in body defence?

(1) Neutrophils (2) Lymphocytes
(3) Macrophages (4) All (1), (2) and (3)

22. Ground substance of connective tissue is formed of:

(1) Phospholipids (2) Lipids
(3) Monosaccharides (4) Muco polysaccharides

23. The characteristic features to identify a nerve cell are:

(1) Cell body with branched cytoplasmic extensions at one end and long projections at the other end.
(2) Rounded or oval cells with bilobed nucleus and cytoplasmic granules.
(3) Spindle shaped cell with a big central nucleus.
(4) Red coloured, biconcave disc shaped enucleated cells.

24. Choose the incorrect matching from the following.

(1) Fluid connective tissue – Blood
(2) Striated muscle – Skeletal muscle
(3) Epithelial tissue – Simplest animal tissue
(4) Nervous tissue – Contractibility

25. Dislocation of bones occurs in persons who have met with and met in accidents due to the

(1) Tendon break
(2) Break of skeletal muscle
(3) Ligament break
(4) Areolar tissue break

26. Which of the following helps in repair of tissue and fills up the space inside the organ?

(1) Tendon (2) Areolar
(3) Adipose (4) Cartilage

27. The epithelium found in the inner lining of stomach, intestine and their glands is

(1) Columnar (2) Cuboidal
(3) Squamous (4) Cubical

28. The cytoplasm of a muscle cell is known as
(1) Neuroplasm (2) Sarcolemma
(3) Axoplasm (4) Sarcoplasm

29. Nissl's granules of neurons are made of:
(1) Ribosomes/RER (2) SER
(3) DNA (4) Golgi complex

30. Matrix of bone contains the spaces called:
(1) Haversian canal (2) Osteobalast
(3) Lacunae (4) Canaliculi

31. The blood component essential for blood coagulation is:
(1) Albumin (2) Globulin
(3) Fibrinogen (4) Vitamins

32. The least leucocytes of human blood is:
(1) Eosinophil
(2) Basophil
(3) Monocyte
(4) Neutrophil

33. Fundamental repeating unit of skeletal myofibrils is
(1) Motor unit
(2) Sarcoplasmic reticulum
(3) Cross, bridges
(4) Sarcomere

34. Cells of germinal epithelium are
(1) Cuboidal (2) Columnar
(3) Sqamous (4) Ciliated

35. Which one acts as shock absorber, when two bones come together?
(1) Cartilage (2) Ligament
(3) Tendon (4) Disc

36. Lining layer of fallopian tubes, nasal passages, bronchi and bronchioles consists of:
(1) Squmous columnar epithelium
(2) Ciliated columnar epithelium
(3) Stratified columnar epithelium
(4) Cuboidal epithelium

37. Major constituent of connective tissue is
(1) Collagen (2) Lipid
(3) Cholesterol (4) Carbohydrate

38. Brush border of small intestine cells formed of:
(1) Microvilli (2) Cilia
(3) Rugae (4) Circular folds

39. Schwann cells are associated with:
(1) Skeletal muscle (2) Cartilage
(3) Connective tissue (4) Nervous tissue

40. Find out the incorrect match from the following.
(1) Inner lining of blood vessel – Squamous epithelium.
(2) Inner lining of fallopian tube – Ciliated epithelium
(3) Germinal epithelium – Cuboidal epithelium
(4) Lining of gastro-Intestinal tract – Simple cuboidal epithelium.

ANSWER KEYS

PRACTICE EXERCISE 2 (A)

1. 3	**2.** 2	**3.** 4	**4.** 2	**5.** 1	**6.** 2	**7.** 4	**8.** 1	**9.** 3	**10.** 2
11. 2	**12.** 1	**13.** 4	**14.** 3	**15.** 1	**16.** 2	**17.** 4	**18.** 3	**19.** 3	**20.** 1
21. 2	**22.** 4	**23.** 2	**24.** 4	**25.** 1	**26.** 3	**27.** 2	**28.** 1	**29.** 3	**30.** 1
31. 4	**32.** 2	**33.** 4	**34.** 3	**35.** 1	**36.** 2	**37.** 3	**38.** 2	**39.** 1	**40.** 4

PRACTICE EXERCISE 2 (B)

1. 1	**2.** 2	**3.** 3	**4.** 2	**5.** 3	**6.** 1	**7.** 4	**8.** 2	**9.** 2	**10.** 3
11. 1	**12.** 2	**13.** 2	**14.** 1	**15.** 3	**16.** 4	**17.** 2	**18.** 1	**19.** 3	**20.** 2
21. 4	**22.** 4	**23.** 1	**24.** 4	**25.** 3	**26.** 2	**27.** 1	**28.** 4	**29.** 1	**30.** 3
31. 3	**32.** 2	**33.** 4	**34.** 1	**35.** 1	**36.** 2	**37.** 4	**38.** 1	**39.** 4	**40.** 4